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MEYERTONS, HOOD, KIVLIN, KOWERT & GOETZEL, P.C.
P.O. BOX 398
AUSTIN, TX 78767-0398

EXAMINER

VO, THANH DUC

ART UNIT PAPER NUMBER

2189

DATE MAILED: 02/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/775,426	Applicant(s) RAO, RAGHAVENDRA J.	
	Examiner Thanh D. Vo	Art Unit 2189	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>6/21/05, 2/17/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is responsive to the Application filed on February 10, 2004.

Claims 1-21 are presented for examination. Claims 1-21 are pending.

The IDS's filed on February 17, 2005 and June 21, 2005 have been considered.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-21 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9, and 14-25 of copending Application No. 10/775,432. Although the conflicting claims are not identical, they are not patentably distinct from each other because:

As to claim 1:

Claim 1 of the present Application is a subset of the claim 1 of copending Application and are concurrently disclosing a storage system comprising:

a cache configured to store a plurality of data blocks in a first plurality of locations, wherein said cache is a non-volatile storage;

a first metadata storage including a plurality of entries configured to store metadata including block addresses of data blocks within said cache, wherein said first metadata storage is a non-volatile storage; and

a second metadata storage including a second plurality of locations configured to store metadata including said block addresses identifying said data blocks within said cache and further including pointers to said data blocks within said cache, wherein said second metadata storage is a volatile storage.

Claim 14 of the present Application is a subset of the claim 14 of copending Application and are concurrently disclosing a method comprising:

storing a plurality of data blocks in a first plurality of locations of a cache, wherein said cache is a non-volatile storage;

storing within a non-volatile first metadata storage including a plurality of entries, metadata including block addresses of data blocks within said cache; and

storing within a volatile second metadata storage including a second plurality of locations, metadata including said block addresses identifying said data blocks within said cache and further including pointers to said data blocks within said cache.

The remainders of the claims are identical to each other. Therefore, claims 1-21 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9, and 14-25 of copending Application No. 10/775,432.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Specification

4. The abstract of the disclosure is objected to because:

While the abstract discloses a storage system including hierarchical cache metadata storages include a **cache**, a first metadata storage, and a second metadata storage. Wherein, **the cache is a non-volatile storage and may store a plurality of data blocks in a first plurality of locations**. The first metadata storage may include a plurality of entries that stores metadata including block addresses of data blocks within the cache. The second metadata storage may include a second plurality of locations for storing metadata including the block addresses identifying the data blocks within the cache.

On the other hand, the Detailed Description discloses a storage cache system 55 is arranged in two-level hierarchical structure. The two-level hierarchical includes first-level metadata stored within metadata storage 220 and second-level metadata stored within metadata storage 230.

Therefore, the abstract is objected to because the disclosure in the abstract is not corresponded to the disclosure in the Specification. The specification once discloses a storage cache system includes a first metadata storage and a second metadata storage while the abstract specifically discloses a cache metadata storage include **a cache**, a first meta data storage and a second metadata storage.

Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1 and 14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

As to claims 1 and 14:

Claims 1 and 14 disclose a cache configured to store a plurality of data blocks in a first plurality of locations, wherein said cache is a non-volatile storage. On the other hand, the specification only discloses storage cache system 55 comprises of a first metadata storage and a second metadata storage. The specification never once

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disclosed a cache configured to store a plurality of data blocks in a first plurality of locations, wherein the said cache is a non-volatile storage **except** the Abstract and the Summary disclosures.

Examiner respectfully request the Applicants to further review the dependent claims of claims 1 and 14 wherein the dependent claims further comprising a cache previously disclosed in claims 1 and 14 which failed to disclose in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Coulson of U.S. Appl. No. 09/895,578 and further in view of Koseki et al. (hereinafter Koseki) of U.S. Patent 6,732,124.

As per claim 1, Coulson disclosed storage system comprising:

a cache (Fig. 1, item 160) configured to store a plurality of data blocks in a first plurality of locations, wherein said cache is a non-volatile storage (see page 1, paragraph 0013-0014);

a second metadata (Fig. 1, item 150) storage including a second plurality of locations configured to store metadata including said block addresses identifying said data blocks within said cache and further including pointers to said data blocks within said cache, wherein said second metadata storage is a volatile storage. See page 1, paragraph 0013-0015.

Coulson failed to disclose a first metadata storage including a plurality of entries configured to store metadata including block addresses of data blocks within said cache, wherein said first metadata storage is a non-volatile storage.

Koseki disclosed a first metadata storage (Fig. 1, item 1a) including a plurality of entries configured to store metadata including block addresses of data blocks within said cache, wherein said first metadata storage is a non-volatile storage (see col. 6, lines 36-50).

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention, it would have been obvious to one having an ordinary skill in the art to realize that it is advantage to combine the first non-volatile metadata storage with the metadata caching system of Coulson.

The motivation of doing so is to enhance the system of Coulson by enabling the metadata to be stored in another non-volatile metadata storage. As being a non-volatile storage, the metadata will not be destroyed once the system is shutoff. Therefore, when the system is back on the metadata in the non-volatile storage can

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easily feedback to the main memory 150 without losing a large amount of metadata entries.

Therefore, it would have been obvious to one having an ordinary skill in the art at the time of the applicant's invention to modify the system of Coulson to combine with Koseki to arrive at the invention claims in claim 1.

As per claim 2, Coulson disclosed a storage system further comprising a cache control unit (Fig. 1, item 130) coupled to said cache and configured to update said first metadata and said second metadata. See page 1, paragraph 0013.

As per claim 3, Coulson disclosed a storage system; wherein each entry of said plurality of entries corresponds to a respective one of said plurality of locations in said cache. See page 2, paragraph 0017.

As per claim 4, Coulson failed disclosed a storage system, wherein each of said second plurality of locations is configured to store metadata corresponding to any of said plurality of locations in said cache storage.

Koseki disclosed the location is configured to store metadata corresponding to the location in the cache storage. See Fig. 1, items 1a, 3 and md2 of each item respectively.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention, it would have been obvious to one having an ordinary skill in the art to realize the advantage of having two metadata, one from the cache storage and the other from another storage linked correspondingly.

The motivation of doing so is to be able to enhance the data transfer capability, avoiding error, and data consistency since the two metadata have to be corresponded to each other so that when the host requests for a metadata file the system will know exactly where to find it.

As per claim 5, Coulson disclosed a storage system, wherein said metadata includes a value indicative of whether a corresponding data block contains valid data. See Fig. 2, item 250 comprises flag bit contains dirty and valid.

As per claim 6, Coulson disclosed a storage system comprising step of write-back, wherein the metadata is being flushed to an underlying storage volume.

Coulson failed to disclose a metadata includes a value indicative of whether a corresponding data block has been flushed to an underlying storage volume.

At the time of the Applicant's invention, it would have been obvious to one having an ordinary skill in the art to realize that it is advantageous to include an indicative value in a metadata to indicate if the metadata has been flushed (write-back) to the storage volume.

The motivation of doing so is to enable the system to make a replacement decision whenever the cache is full or the metadata became old depends on the cache

replacement logic. In addition, the indicative value will further indicate if the value is successfully written to the storage volume.

Therefore, it would have been obvious to one having an ordinary skill in the art at the time of the Applicant's invention to modify the system of Coulson to combine an indicative value to indicate if a data block has been flushed to an underlying storage volume.

As to claim 7, Coulson failed to disclose a storage system, wherein said metadata includes a value corresponding to a volume identifier of an underlying storage volume.

Koseki disclosed a metadata includes a value corresponding to a volume identifier of an underlying storage volume. See Fig. 1, Volume ID.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention it would have been obvious to one having an ordinary skill in the art to modify the system of Coulson to include a volume identifier as a pointer to indicate the location of the volume which the metadata is being stored or to be stored.

The motivation of doing is to efficiently and properly pinpoint the storage location of the metadata so that the data will be coordinately stored for the next retrieval/read.

As per claim 8, Coulson failed to disclose a storage system, wherein said metadata stored within said second metadata storage is arranged into one or more cache descriptors each associated with a respective data block.

Koseki disclosed a metadata descriptor, which is equivalent to a cache descriptor, associative with a respective data block. See Fig. 12 and col. 15, line 50 – col. 16 line 15.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention it would have been obvious to one having an ordinary skill in the art to modify the system of Coulson to include a cache descriptor as a pointer to indicate the location of the data block which is corresponded to the metadata is being stored or to be stored.

The motivation of doing is to efficiently and properly pinpoint the storage location of the data block so that the data will be coordinately stored for the next retrieval/read.

As per claim 9, Coulson failed to disclose a storage system, wherein said one or more cache descriptors are arranged into one or more groups, wherein a given group includes one or more cache descriptors that correspond to contiguous logical block addresses of an underlying storage volume.

Koseki disclosed a storage system, wherein said one or more cache descriptors are arranged into one or more groups, wherein a given group includes one or more cache descriptors that correspond to contiguous logical block addresses of an

underlying storage volume. See Fig. 1, item 5 and corresponding description in col. 6 and col. 7.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention it would have been obvious to one having an ordinary skill in the art to modify the system of Coulson to include a group of descriptor that comprise of cache descriptor as a pointer to indicate the location of the logical data block which is corresponded to the metadata is being stored or to be stored.

The motivation of doing is to efficiently and properly pinpoint the storage location of the data block so that the data will be coordinately stored for the next retrieval/read.

As per claim 10, Coulson disclosed a storage system, wherein said storage system further comprising a storage (Fig. 1, item 170) for storing data including said plurality of data blocks cached within said cache. See pages 1 and 2, paragraphs 0013-0016.

As per claim 11, Coulson disclosed a storage system further comprising a controller unit (Fig. 1, item 130) coupled between said storage and said cache and configured to control storage of said data within said storage.

As to claim 12, Coulson disclosed a storage system, wherein said storage includes a storage volume including at least one physical storage device. See Fig. 1, item 130 and paragraph 0013-0016.

As per claim 13, Coulson disclosed a storage system, wherein said at least one physical storage device includes a magnetic device.

Although Coulson failed to disclose the storage device is a hard disk drives but it would have been obvious to one having an ordinary skill in the art at the time of the Applicant's invention to realize that a magnetic device comprises of magnetic disk drives and magnetic tape. Wherein, magnetic disk drive is equivalent to hard disk drive.

Therefore, it would have been obvious to one having an ordinary skill in the art at the time of the Applicant's invention to utilize the hard disk drive to store the data since a hard disk drive is faster to search, read, or write data.

As per claim 14, Coulson disclosed a method comprising:

storing a plurality of data blocks in a first plurality of locations of a cache (Fig. 1, item 160), wherein said cache is a non-volatile storage (See page 1, paragraph 0013-0014);

storing within a volatile second metadata storage (Fig. 1, item 150) including a second plurality of locations, metadata including said block addresses identifying said

data blocks within said cache and further including pointers to said data blocks within said cache. See page 1, paragraph 0013-0015.

Coulson failed to disclose a first metadata storage including a plurality of entries configured to store metadata including block addresses of data blocks within said cache, wherein said first metadata storage is a non-volatile storage.

Koseki disclosed a method of storing within a non-volatile first metadata storage (Fig. 1, item 1a) including a plurality of entries, metadata including block addresses of data blocks within said cache (see col. 6, lines 36-50)

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention, it would have been obvious to one having an ordinary skill in the art to realize that it is advantage to combine the first non-volatile metadata storage with the metadata caching system of Coulson.

The motivation of doing so is to enhance the system of Coulson by enabling the metadata to be stored in another non-volatile metadata storage. As being a non-volatile storage, the metadata will not be destroyed once the system is shutoff. Therefore, when the system is back on the metadata in the non-volatile storage can easily feedback to the main memory 150 without losing a large amount of metadata entries.

Therefore, it would have been obvious to one having an ordinary skill in the art at the time of the applicant's invention to modify the system of Coulson to combine with Koseki to arrive at the invention claims in claim 14.

As per claim 15, Coulson disclosed a method; wherein each entry of said plurality of entries corresponds to a respective one of said plurality of locations in said cache. See page 2, paragraph 0017.

As per claim 16, Coulson failed disclosed a method, wherein each of said second plurality of locations is configured to store metadata corresponding to any of said plurality of locations in said cache storage.

Koseki disclosed the location is configured to store metadata corresponding to the location in the cache storage. See Fig. 1, items 1a, 3 and md2 of each item respectively.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention, it would have been obvious to one have an ordinary skill in the art to realize the advantage of having two metadata, one from the cache storage and the other from another storage linked correspondingly.

The motivation of doing so is to be able to enhance the data transfer capability, avoiding error, and data consistency since the two metadata have to be corresponded to each other so that when the host requests for a metadata file the system will know exactly where to find it.

As per claim 17, Coulson disclosed a method, wherein said metadata includes a value indicative of whether a corresponding data block contains valid data. See Fig. 2, item 250 comprises flag bit contains dirty and valid.

As per claim 18, Coulson disclosed a method comprising step of write-back, wherein the metadata is being flushed to an underlying storage volume.

Coulson failed to disclose a metadata includes a value indicative of whether a corresponding data block has been flushed to an underlying storage volume.

At the time of the Applicant's invention, it would have been obvious to one having an ordinary skill in the art to realize that it is advantageous to include an indicative value in a metadata to indicate if the metadata has been flushed (write-back) to the storage volume.

The motivation of doing so is to enable the system to make a replacement decision whenever the cache is full or the metadata became old depends on the cache replacement logic. In addition, the indicative value will further indicate if the value is successfully written to the storage volume.

Therefore, it would have been obvious to one having an ordinary skill in the art at the time of the Applicant's invention to modify the system of Coulson to combine an indicative value to indicate if a data block has been flushed to an underlying storage volume.

As to claim 19, Coulson failed to disclose a method, wherein said metadata includes a value corresponding to a volume identifier of an underlying storage volume.

Koseki disclosed a metadata includes a value corresponding to a volume identifier of an underlying storage volume. See Fig. 1, Volume ID.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention it would have been obvious to one having an ordinary skill in the art to modify the system of Coulson to include a volume identifier as a pointer to indicate the location of the volume which the metadata is being stored or to be stored.

The motivation of doing is to efficiently and properly pinpoint the storage location of the metadata so that the data will be coordinately stored for the next retrieval/read.

As per claim 20, Coulson failed to disclose a method, wherein said metadata stored within said second metadata storage is arranged into one or more cache descriptors each associated with a respective data block.

Koseki disclosed a metadata descriptor, which is equivalent to a cache descriptor, associative with a respective data block. See Fig. 12 and col. 15, line 50 – col. 16 line 15.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention it would have been obvious to one having an ordinary skill in the art to modify the system of Coulson to include a cache descriptor as a pointer to indicate the location of the data block which is corresponded to the metadata is being stored or to be stored.

The motivation of doing is to efficiently and properly pinpoint the storage location of the data block so that the data will be coordinately stored for the next retrieval/read.

As per claim 21, Coulson failed to disclose a method, wherein said one or more cache descriptors are arranged into one or more groups, wherein a given group includes one or more cache descriptors that correspond to contiguous logical block addresses of an underlying storage volume.

Koseki disclosed a storage system, wherein said one or more cache descriptors are arranged into one or more groups, wherein a given group includes one or more cache descriptors that correspond to contiguous logical block addresses of an underlying storage volume. See Fig. 1, item 5 and corresponding description in col. 6 and col. 7.

Coulson and Koseki are from the same field of endeavor, data processing and metadata caching system.

At the time of the Applicant's invention it would have been obvious to one having an ordinary skill in the art to modify the system of Coulson to include a group of descriptor that comprise of cache descriptor as a pointer to indicate the location of the

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logical data block which is corresponded to the metadata is being stored or to be stored.

The motivation of doing is to efficiently and properly pinpoint the storage location of the data block so that the data will be coordinately stored for the next retrieval/read.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh D. Vo whose telephone number is (571) 272-0708. The examiner can normally be reached on M-F 9AM-5:30PM.

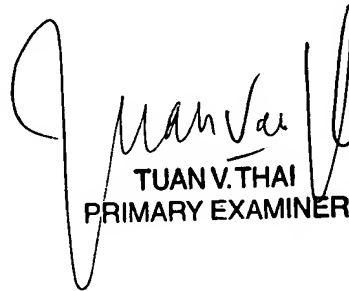
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Kim can be reached on (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Thanh Vo
Patent Examiner
Art Unit 2189
2/20/2006



TUAN V. THAI
PRIMARY EXAMINER